

- 101 -

WHAT IS CLAIMED IS:

1. A radiological imaging apparatus comprising:
 an X-ray source apparatus that radiates X-rays; and
 a plurality of radiation detectors that output both a first detection signal which is a detection signal of said X-rays that have passed through a test subject and a second detection signal which is a detection signal of γ -rays radiated from said test subject.
2. The radiological imaging apparatus according to claim 1, further comprising a tomographic image data creation apparatus that creates first tomographic image data of said test subject based on said first detection signal, creates second tomographic image data of said test subject based on said second detection signal and creates fused tomographic image data combining said first tomographic image data and said second tomographic image data.
3. The radiological imaging apparatus according to claim 1 or claim 2, further comprising a controller that instructs said X-ray source apparatus to radiate and stop radiating X-rays alternately and to radiate X-rays for a set time.
4. The radiological imaging apparatus according to claim 1, wherein said radiation detector is either a semiconductor radiation detector or a scintillator.
5. The radiological imaging apparatus according

- 102 -

to claim 1, wherein an image pickup apparatus is provided with a collimator placed facing said radiation detectors arranged in a ring form and said collimator is placed inside said radiation detectors.

6. A radiological imaging apparatus comprising:
an X-ray source apparatus that radiates X-rays; and

a plurality of radiation detectors that output an output signal including a first detection signal which is a detection signal of said X-rays that have passed through a test subject and a second detection signal which is a detection signal of γ -rays radiated from said test subject.

7. The radiological imaging apparatus according to claim 6, further comprising a plurality of signal discriminators connected to said respective radiation detectors, which separate said first detection signal and said second detection signal from said output signal entered.

8. The radiological imaging apparatus according to claim 6 or claim 7, further comprising a tomographic image data creation apparatus that creates first tomographic image data of said test subject based on said first detection signal, creates second tomographic image data of said test subject based on said second detection signal and creates fused tomographic image data combining said first tomographic image data and said second tomographic image data.

- 103 -

9. The radiological imaging apparatus according to claim 6, wherein said radiation detector is either a semiconductor radiation detector or a scintillator.

10. A radiological imaging apparatus comprising:
an X-ray source apparatus that radiates X-rays;

a plurality of first radiation detectors that output an output signal including a first detection signal which is a detection signal of said X-rays that have passed through a test subject and a second detection signal which is a detection signal of γ -rays radiated from said test subject;

a plurality of second radiation detectors that output an output signal including a first detection signal which is the detection signal of said X-rays and a second detection signal which is the detection signal of said γ -rays;

a signal processor that calculates an intensity of said first detection signal based on the output signal of said first radiation detector;

a signal discriminator that separates said second detection signal from the output signal of said second radiation detector; and

a counter that calculates a count rate for the second detection signal separated by said signal discriminator.

11. The radiological imaging apparatus according to claim 10, further comprising a tomographic image

- 104 -

data creation apparatus that creates first tomographic image data of said test subject based on the intensity of said first detection signal, creates second tomographic image data of said test subject based on the count rate of said second detection signal and creates fused tomographic image data combining said first tomographic image data and said second tomographic image data.

12. A radiological imaging apparatus comprises:
a test subject holding apparatus provided with a bed which is movable in a longitudinal direction to carry a test subject; and
an image pickup apparatus,

wherein said image pickup apparatus
comprises:

a radiation detector ring structure that surrounds an area in which said bed is inserted and includes a plurality of radiation detectors;

an X-ray source that irradiates said test subject with X-rays; and

an X-ray source transfer apparatus that transfers said X-ray source in the circumferential direction of said radiation detector ring structure, and

said respective radiation detectors output both a first detection signal which is the detection signal of said X-rays that have passed through said test subject and a second detection signal which is the

- 105 -

detection signal of γ -rays radiated from said test subject.

13. The radiological imaging apparatus according to claim 12, further comprising a tomographic image data creation apparatus that creates first tomographic image data of said test subject based on said first detection signal, creates second tomographic image data of said test subject based on said second detection signal and creates fused tomographic image data combining said first tomographic image data and said second tomographic image data.

14. The radiological imaging apparatus according to claim 12, further comprising an X-ray source controller that instructs said X-ray source apparatus to radiate and stop radiating X-rays alternately and to radiate X-rays for a set time.

15. The radiological imaging apparatus according to claim 14, further comprising for each of said radiation detectors:

- a first signal processor that processes said first detection signal;

- a second signal processor that processes said second detection signal;

- a signal processor provided with a switching apparatus that transmits said first detection signal from said radiation detectors to said first signal processor and transmits said second detection signal from said radiation detectors to said second signal

- 106 -

processor; and

a switching control apparatus that controls said switching apparatus so that said first detection signal output from said radiation detector selected according to the position of said X-ray source transfer apparatus in the circumferential direction of said radiation detector ring structure is transmitted to said first signal processor.

16. The radiological imaging apparatus according to claim 15, further comprising a tomographic image data creation apparatus that creates first tomographic image data of said test subject based on the output of said first signal processor, creates second tomographic image data of said test subject based on the output of said second signal processor and creates fused tomographic image data combining said first tomographic image data and said second tomographic image data.

17. The radiological imaging apparatus according to claim 15, further comprising an X-ray source controller that instructs said X-ray source apparatus to radiate and stop radiating X-rays alternately and to radiate X-rays for a set time.

18. The radiological imaging apparatus according to claim 12, wherein said image pickup apparatus comprises a collimator placed facing each of said radiation detectors and said collimator is located inside said radiation detector ring structure.

19. The radiological imaging apparatus according

- 107 -

to claim 18, further comprising a collimator transfer apparatus that transfers said collimator in the axial direction of said radiation detector ring structure.

20. The radiological imaging apparatus according to claim 12, wherein said radiation detector is either a semiconductor radiation detector or scintillator.

21. A radiological imaging apparatus comprising: a test subject holding apparatus provided with a bed which is movable in a longitudinal direction to carry a test subject; and an image pickup apparatus,

wherein said image pickup apparatus comprises:

a radiation detector ring structure that surrounds an area in which said bed is inserted and includes a plurality of radiation detectors;

an X-ray source that irradiates said test subject with X-rays; and

an X-ray source transfer apparatus that transfers said X-ray source in the circumferential direction of said radiation detector ring structure, and

said respective radiation detectors output an output signal including a first detection signal which is the detection signal of said X-rays that have passed through said test subject and a second detection signal which is the detection signal of γ -rays radiated from said test subject.

- 108 -

22. The radiological imaging apparatus according to claim 21, further comprising a signal discriminator which separates said first detection signal and said second detection signal from said output signal entered and which is connected to each of said plurality of radiation detectors.

23. The radiological imaging apparatus according to claim 22, further comprising said signal discriminator that separates said first detection signal and said second detection signal based on energy of said output signal.

24. The radiological imaging apparatus according to claim 22, further comprising a tomographic image data creation apparatus that creates first tomographic image data of said test subject based on said first detection signal, creates second tomographic image data of said test subject based on said second detection signal and creates fused tomographic image data combining said first tomographic image data and said second tomographic image data.

25. The radiological imaging apparatus according to claim 21, wherein said image pickup apparatus comprises a collimator placed facing each of said radiation detectors and said collimator is located inside said radiation detector ring structure.

26. The radiological imaging apparatus according to claim 25, further comprising a collimator transfer apparatus that transfers said collimator in the axial

- 109 -

direction of said radiation detector ring structure.

27. The radiological imaging apparatus according to claim 21, wherein said radiation detector is either a semiconductor radiation detector or scintillator.

28. A radiological imaging apparatus comprises: a bed for carrying a test subject; and an image pickup apparatus,

wherein said image pickup apparatus comprises:

a radiation detector ring structure that detects radiation from said test subject and includes a plurality of radiation detectors arranged in a ring form;

an X-ray source that irradiates said test subject with X-rays; and

an X-ray source transfer apparatus that transfers said X-ray source in the circumferential direction of said radiation detector ring structure.

29. The radiological imaging apparatus according to claim 28, further comprising an X-ray source axial transfer apparatus that transfers said X-ray source in the axial direction of said radiation detector ring structure.

30. The radiological imaging apparatus according to claim 28, wherein said X-ray source moves in a circumferential direction of said radiation detector ring structure inside said radiation detector ring structure.

- 110 -

31. The radiological imaging apparatus according to claim 28, wherein said X-ray source moves in a circumferential direction of said radiation detector ring structure outside said radiation detector ring structure.

32. The radiological imaging apparatus according to claim 31, wherein said X-ray source is placed outside said radiation detector ring structure in a direction of a radius of said radiation detector ring structure and said radiation detector ring structure forms a slit that lets X-rays radiated from said X-ray source pass through toward the inside of said radiation detector ring structure.

33. The radiological imaging apparatus according to claim 32, wherein a plurality of said radiation detector ring structures are placed in the axial direction and a slit that lets X-rays radiated from said X-ray source pass through toward the inside of said radiation detector ring structures is formed between said radiation detector ring structures.

34. The radiological imaging apparatus according to claim 32 or claim 33, wherein a collimator through which said X-rays pass is placed between said slit and said radiation detectors and said radiation detectors are placed around said collimator.

35. The radiological imaging apparatus according to claim 31, wherein said X-ray source is placed outside said radiation detector ring structure in the

- 111 -

axial direction of said radiation detector ring structure so that X-rays radiated from said X-ray source reach said radiation detectors of said radiation detector ring structure.

36. The radiological imaging apparatus according to claim 28, wherein said radiation detector is a semiconductor radiation detector.

37. The radiological imaging apparatus according to claim 28, wherein said respective radiation detectors output both a first detection signal which is the detection signal of said X-rays which is one type of said radiation that have passed through said test subject and a second detection signal which is the detection signal of γ -rays which is another type of said radiation radiated from said test subject.

38. The radiological imaging apparatus according to claim 37, further comprising a controller that instructs said X-ray source to radiate and stop radiating X-rays alternately and to radiate X-rays for a set time.

39. The radiological imaging apparatus according to claim 37, further comprising a tomographic image data creation apparatus that creates first tomographic image data of said test subject based on said first detection signal, creates second tomographic image data of said test subject based on said second detection signal and creates fused tomographic image data combining said first tomographic image data and said

- 112 -

second tomographic image data.

40. The radiological imaging apparatus according to claim 28, wherein said radiation detector outputs an output signal including a first detection signal which is the detection signal of said X-rays which is one type of said radiation that have passed through said test subject and a second detection signal which is the detection signal of γ -rays which is another type of said radiation radiated from said test subject.

41. The radiological imaging apparatus according to claim 40, further comprising a signal discriminator that separates said first detection signal and said second detection signal from said output signal entered and is connected to each of said plurality of radiation detectors.

42. The radiological imaging apparatus according to claim 41, further comprising a tomographic image data creation apparatus that creates first tomographic image data of said test subject based on said first detection signal, creates second tomographic image data of said test subject based on said second detection signal and creates fused tomographic image data combining said first tomographic image data and said second tomographic image data.

43. A radiological imaging apparatus comprises:
a bed for carrying a test subject; and
an image pickup apparatus,

wherein said image pickup apparatus

- 113 -

comprises:

a plurality of radiation detectors that detects radiation from said test subject and is arranged in a ring form;

a rotating radiation detector ring structure;

an X-ray source that rotates together with said radiation detector ring structure and irradiates said test subject with X-rays, and

a drive unit that rotates said radiation detector ring structure.

44. The radiological imaging apparatus according to claim 43, wherein said radiation detector is a semiconductor radiation detector.

45. The radiological imaging apparatus according to claim 43, wherein said radiation detector outputs a first detection signal which is a detection signal of said X-rays which is one type of said radiation that have passed through said test subject and a second detection signal which is a detection signal of γ -rays which is another type of said radiation radiated from said test subject.

46. A radiological imaging method of carrying out an X-ray computed tomographic inspection and PET inspection on a test subject using:

a radiation detector ring structure including a plurality of radiation detectors which detects radiation from said test subject and which is arranged in a ring form;

- 114 -

an X-ray source that irradiates said test subject with X-rays; and

X-ray source transferring means for transferring said X-ray source in the circumferential direction of said radiation detector ring structure.